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Langley Research Center



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Refrigerated Cutting Tools Improve Machining of Superalloys

The problem:

Turning and milling operations on Rene-41 are difficult and time consuming because the rate of cutting is limited to 0.14 m/sec (28 fpm) by the heat buildup at the cutting edge of the tool. Flooding the tool with a cutting fluid does not provide adequate heat dissipation, and leaves a deposit which has to be removed from both the work and the tool. Electrical discharge machining methods are too expensive and time consuming.

The solution:

Use Freon-12 refrigerant to cool the tool more effectively.

How it's done:

A spray of liquid Freon-12 is directed onto the tool cutting edge, under the nose radius. Applying the Freon-12 at this point avoids interference by the chip being removed. The Freon-12 evaporates completely, leaving no residue, and effectively cools the cutting edge of the tool, permitting a higher cutting rate than with conventional coolants. Special tools have been designed to conduct and direct the coolant to the cutting edge. In the case of a milling tool with inserted teeth, the Freon-12 is applied only on the tooth doing the cutting.

With this technique, cutting rates on Rene-41 have increased as much as three times over that recommended for conventional coolants, and the finish of the machined surface is also improved.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
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Reference: TSP71-10076

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be directed to:

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